WRZ Series One-to-One Wireless Room Sensing System Technical Bulletin

Introduction

This document describes how to commission, configure, and troubleshoot the WRZ-7860-0 Receiver, WRZ Series Sensors, and One-to-One wireless room sensing systems.

This document does not describe how to locate or install the WRZ-7860-0 Receiver and the WRZ Series Sensors. Also, this document does not describe how to install, commission, operate, or troubleshoot any of the digital field controllers that support One-to-One sensing system applications.

Related documentation

Table 1: WRZ Series One-to-One Wireless Room Sensing System related documents

For information about	See document
Applications, features, and benefits of the WRZ-7860-0 Receiver	*WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems Product Bulletin (LIT-12011640)*
Locating, mounting, and wiring the WRZ-7860-0 Receiver	*WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems Installation Guide (Part No. 24-10563-47)*
Applications, features, and benefits of the WRZ Series Wireless Room Sensors	*WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)*
Locating, mounting, and wiring the WRZ Series Wireless Room Sensors	*WRZ Series Wireless Room Sensors Installation Guide (Part No. 24-10332-2)*
Locating, mounting, and wiring the Occupancy Sensing WRZ Series Wireless Room Sensors	*Occupancy Sensing WRZ Series Wireless Room Sensors Installation Guide (Part No. 24-10332-96)*
Locating, mounting, and wiring the WRZ-TTB Series Wireless Room Sensors	*WRZ-TTB0000-5 Handheld Temperature Room Sensor Installation Guide (Part No. 24-10724-0)*
Locating, mounting, and wiring the ZFR1811 Wireless Field Router	*ZFR1811 Wireless Field Router Installation Guide (Part No. 24-10325-10)*
Locating, mounting, and wiring the ZFR1812 Wall Mount Wireless Field Router	*ZFR1812 Wireless Field Router Installation Guide (Part No. 24-10325-45)*

One-to-One Wireless Room Sensing System overview

Use the WRZ Series One-to-One Wireless Room Sensing System to interface with supported Johnson Controls® BACnet® MS/TP controllers to provide wireless control of single-zone, room temperature, and humidity applications. The WRZ Series Sensor and WRZ-7860-0 Receiver combination is a functional equivalent to a wired network sensor, such as an NS8000 Network Sensor, but eliminates communication wiring, which is usually placed inside the wall.

A simple One-to-One Wireless Room Sensing System consists of one to five WRZ Series Wireless Room Sensors that communicate single-zone temperature, humidity, and occupancy data to an associated WRZ-7860-0 Receiver. See Figure 1.

A WRZ-7860-0 Receiver interfaces with a single Johnson Controls controller.

See *WRZ Series Wireless Room Sensors* for more information on the WRZ Series Sensors.

ⓘ **Note:** Multiple WRZ Series Sensor models, a single model WRZ-7860-0 Receiver, and the ZFR-HPSST-0 Wireless Sensing System Tool are available. The WRZ-7860-0 and WRZ are 10mW transmission power devices.

The receiver meets the IEEE 802.15.4 standard for low power, low duty cycle Radio Frequency (RF) transmitting systems and operates on the 2.4 GHz Industrial, Scientific, Medical (ISM) band. The One-to-One Wireless Room Sensing System is for indoor applications only, do not use for outdoor or inter-building applications.

The WRZ Series Sensors and the WRZ-7860-0 Receiver operate as transceivers to create a bidirectional association between the sensors and the receivers; this association uses the sensing system to confirm data transmissions between the devices. You must locate and install the sensors and receivers correctly to provide adequate RF signal strength to maintain this wireless association.

The maximum transmission range for indoor line-of-sight transmissions between a WRZ Series Sensor and an associated WRZ-7860-0 Receiver is 150 ft (45 m). With consideration of RF signal absorption and reflection due to metal obstructions, walls, and furniture found in typical building interiors, the practical average indoor line-of-sight transmission range between a sensor and receiver is 100 ft (30 m). See *Related Documentation* for references to installation guides.

To extend the range between the WRZ-7860 and a WRZ sensor, install a ZFR1811-1 conduit mount flag or the ZFR1812-0 wall mount wireless router, in a repeater configuration. The ZFR1811 requires the MS-ZFRRPT-0 accessory kit to operate as a repeater. You can order the ZFR1812 as a repeater in a single kit number. Using a repeater can help extend the transmission range through or around obstacles if line-of-sight installation is not possible.

❱ **Important:**

The WNC1800, ZFR1820 or ZFR1830 Pro Series Wireless Field Bus System and associated hardware excluding sensors are not compatible with the WRZ-7860 Wireless System. You can use WRZ sensors in either ZFR, ZFR Pro Series, or the WRZ-7860 system, but not in the same instance.

ⓘ **Note:** The MS-ZFR183x-0 Pro Router and Repeater is not compatible with the WRZ-7860 system.

Figure 1: One-to-One Wireless Room Sensing applications
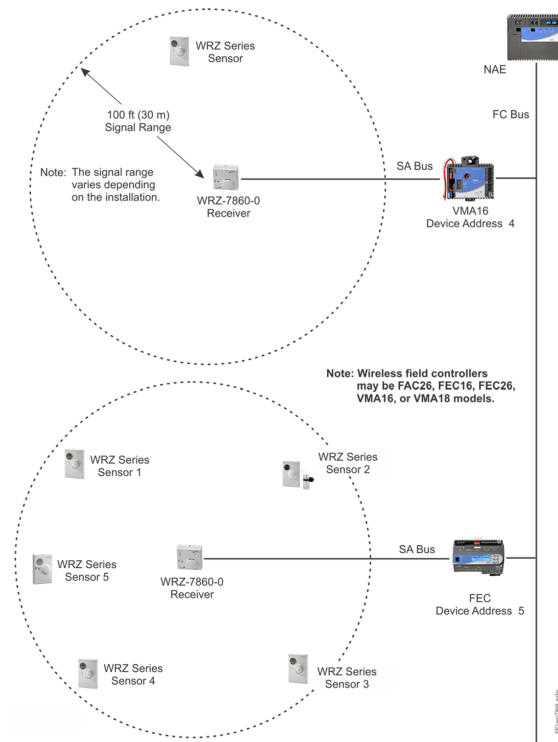
The sensors and receivers associate to each other with matched unique RF addresses. To establish the RF on the devices, set the switches on the address DIP switch blocks on the devices. After you create the sensor and receiver associations, the sensors transmit data at 60-second intervals:

- Sensed zone temperature occupancy, passive infrared (PIR), and humidity, depending on the WRZ Series Sensor model
- Setpoint temperature, depending on the WRZ Series Sensor model
- Zone occupancy override request

See *Radio Frequency Addresses for One-to-One Applications*, *Setting the WRZ-7860-0 Receiver RF Address*, and *Setting the WRZ Series Sensor RF Address* for more information on how to set RF addresses in One-to-One sensing system applications.

In One-to-One applications with two to five sensors, the receiver passes all the sensors data to the controller. Configure the controller to either average the sensors temperature or humidity input independently, or select the highest or lowest sensed temperature or humidity for control of the target zone. Refer to the appropriate controller or system documents for additional information.

ⓘ **Note:** For WRZ Series Sensors with an LCD display, the humidity value may appear as 0.0% when the sensor is joining a network. This condition is transitory and does not transfer to the Building Automation System (BAS).

The WRZ Series Sensors and the WRZ-7860-0 Receiver also provide signal strength indication and other wireless diagnostic data.

◼ **Important:**

Do not use the One-to-One Wireless Room Sensing System, WRZ-7860-0 Receiver, and WRZ Series Sensors in mission-critical or life and safety applications.

ⓘ **Note:** The WRZ Series Sensors and the WRZ-7860-0 Receiver are not compatible with the WRS-TTx Sensors and the TE-7820 or TE-7830 Receivers.

WRZ Series Wireless Room Sensors

Use the WRZ Series Wireless Room Sensors to sense room or zone temperature and humidity, and transmit wireless temperature or humidity, and zone status data to the WRZ-7860-0 Receiver. See Figure 2.

The WRZ Series Sensors can transmit the sensed temperature and humidity, setpoint temperature, occupancy override request, and low-battery conditions to an associated receiver. The receiver passes the sensor data to a controller.

The WRZ Series Sensors also provide manual occupancy override and signal strength diagnostic capabilities. See the following table for the available WRZ Series Sensor models.

Table 2: WRZ Wireless Sensors

| Product code number	Description
WRZ-MHN0100-2	Wireless Room Temperature and Humidity Sensor with Passive Infrared (PIR) occupancy sensor, battery level and signal strength LED, manual occupancy override button, without display, ZFR183x compatible
WRZ-MTJ0100-2	Wireless Room Temperature Sensor with PIR occupancy sensor, display, setpoint button adjustment for Warmer/Cooler (+/-) setpoint adjustment or scaled setpoint adjustment: 55°F to 85°F (13°C to 29°C), and manual occupancy override button, ZFR183x compatible
WRZ-RMT10K-2	Wireless Room Temperature Sensor for Remote 10K Temperature Probes, display, °F/°C button, and manual occupancy override button, ZFR183x compatible
WRZ-STR0000-2	Wireless Room Temperature Sensor with Remote 3K Refrigerator or Freezer Temperature Probe, display, °F/°C button, and manual occupancy override button, ZFR183x compatible
WRZ-THJ0000-2	Wireless Room Temperature or Humidity Sensor with display, setpoint adjustment buttons for Warmer/Cooler (+/-) setpoint adjustment or scaled setpoint adjustment: 55°F to 85°F (13°C to 29°C), °F/°C button, RH button, and manual occupancy override button, ZFR183x compatible
WRZ-THN0000-2	Wireless Room Temperature and Humidity Sensor with battery level or signal strength LED and manual occupancy override button, ZFR183x compatible
WRZ-TTJ0000-2	Wireless Room Temperature Sensor with display, setpoint adjustment buttons for Warmer/Cooler (+/-) setpoint adjustment or scaled setpoint adjustment: 55°F to 85°F (13°C to 29°C), °F/°C button, and manual occupancy override button, ZFR183x compatible
WRZ-TTK0000-2	Wireless Room Temperature Sensor with display, setpoint adjustment buttons for Warmer/Cooler (+/-) setpoint adjustment or scaled setpoint adjustment: 55°F to 85°F (13°C to 29°C), °F/°C button, fan speed control button, and manual occupancy override button, ZFR183x compatible
WRZ-TTP0000-2	Wireless Room Temperature Sensor with Warmer/Cooler (+/-) setpoint dial adjustment, battery level or signal strength LED, and manual occupancy override button, ZFR183x compatible
WRZ-TTR0000-2	Wireless Room Temperature Sensor with battery level or signal strength LED, manual occupancy override button, and no setpoint dial adjustment, ZFR183x compatible
WRZ-TTS0000-2	Wireless Room Temperature Sensor with setpoint dial adjustment scale: 55°F to 85°F (13°C to 29°C), battery level or signal strength LED, and manual occupancy override button, ZFR183x compatible
ZFR-HPSST-0	Wireless Sensing System Tool is a lightweight, portable, wireless transmitter/receiver designed to serve as an RF signal tester or site survey tool prior to installation of a ZFR18xx Series Wireless Field Bus System
T-4000-119	Allen-head adjustment tool: 1/16 in. (1.6 mm), 30 tools per bag

Use the WRZ Series Wireless Room Sensors for use in wireless mesh network systems that use the 802.15.4 standard. The WRZ series sensors are compatible with both the ZFR and ZFR Pro Series Wireless Remote Field Bus Systems. Refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295), the WNC1800/ ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356) or the FX WRG1830/ZFR183x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12013554)* for more information.

ⓘ **Note:** Do not attempt to set up a WRZ Series Sensor to report to more than one WRZ-7860-0 Receiver. One-to-One wireless sensing system applications do not support global sharing of a sensor's data. Attempting to set a single sensor to report to multiple receivers results in controller malfunctions and loss of temperature and humidity control in the zones.

## Manual Occupancy Override button

Pressing the manual occupancy override button, which is located on the left side of the sensor, serves two main functions. First, it temporarily sets the space to an occupied state. Second, it checks the wireless signal strength of the sensor. The LED on the sensor flashes 3 times to indicate a strong signal, 2 times to indicate a good signal, or 1 time to indicate a marginal signal. For sensors with an LCD display, a number of bars on the display indicates wireless signal strength, 3 bars for a strong signal, 2 bars for a good signal, or 1 bar for a marginal signal.

Figure 2: WRZ Series Sensor with Occupancy Sensor and setpoint adjustment buttons, in. (mm)
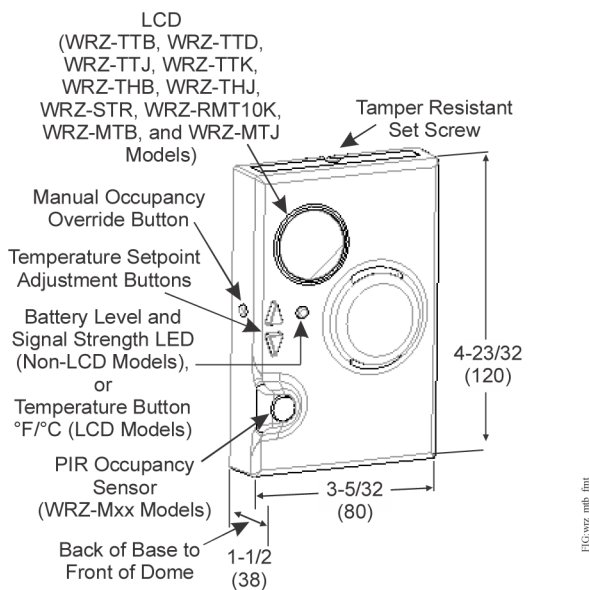
ⓘ **Note:** Not all features shown on Figure 2 and Figure 3 are available on all models. See Table 2 for a list of features on each model.

Figure 3: WRZ Series Sensor with occupancy sensor and setpoint adjustment dial model shown, in. (mm)
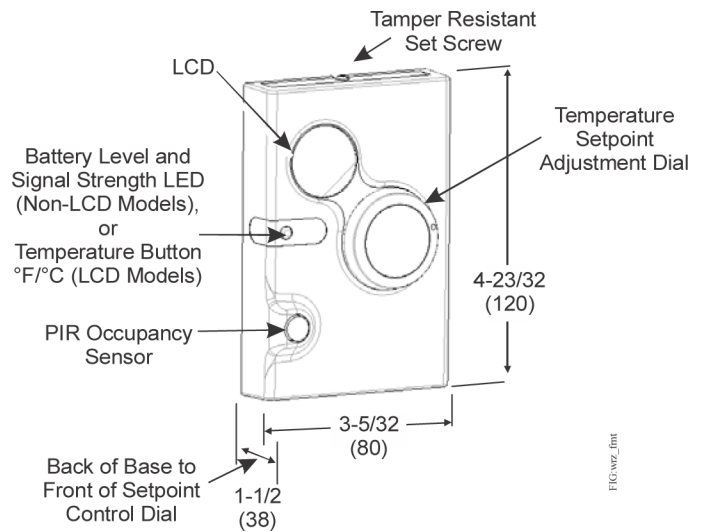
WRZ-7860-0 Receiver

Use the WRZ-7860-0 Receiver to receive wireless data messages from WRZ Series Sensors, and communicate that data through a hardwired Sensor Actuator (SA) bus connection to a Johnson Controls controller. See Figure 4.

Figure 4: WRZ-7860-0 Receiver physical features and dimensions, in. (mm)
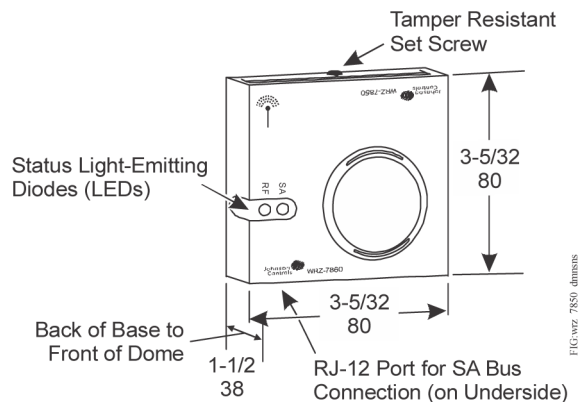
The WRZ-7860-0 Receiver collects wireless data transmissions that contains the sensed zone temperature and humidity, the zone temperature setpoint, the zone occupancy override request, signal strength measurements, and sensor low-battery conditions from one to five associated WRZ Series Wireless Sensors. The receiver then processes the zone data and delivers that data directly to a single controller through a hardwired MS/TP SA bus interface.

The WRZ-7860-0 Receiver has a 6-pin RJ-12 port for the SA bus interface with a controller, an LED that indicates RF signal, an LED that indicates SA bus status, and two DIP switch blocks for setting the **TRANSMITTER ID** address and **AREA** address. See Figure 5. The RF signal LED also goes from green to red if any of the associated sensors reports that its battery voltage level is low. The receiver obtains nominal 15 VDC power from the SA bus.

RF interference and security in One-to-One applications

Use the WRZ Series Sensors, WRZ-7860-0 Receiver, and the One-to-One Wireless Sensing System to eliminate RF interference with other wireless applications. In most commercial environments, the One-to-One system does not encounter or generate significant RF interference, even in environments saturated with cell phones and competing Wireless Fidelity (Wi-Fi) applications.

The WRZ Series Sensors and WRZ-7860-0 Receiver operate on multiple discrete channels within the 2.4 GHz ISM band and use multi-frequency Direct-Sequence, Spread-Spectrum (DSSS) technology.

Cell phones do not operate on the 2.4 GHz ISM band, and cell phone interference is not a problem with One-to-One Wireless Room Sensing Systems, except potentially when a cell phone operates within 3 ft (1 m) of a WRZ Series Receiver. When One-to-One Wireless Room Sensing Systems encounter most other Wi-Fi transmissions in the 2.4 GHz ISM band, the transmissions appear as merely noise and do not significantly impact wireless sensing system communication.

With DSSS technology, use the WRZ Series Sensor to transmit a data message to the associated receiver every 60 seconds. When a single data burst is successfully received and acknowledged, the sensor goes dormant for 60 seconds and then repeats the transmission burst sequence.

When the RF interference is encountered, the One-to-One Wireless Room Sensing System changes to a different channel to enhance reliability. The WRZ-7860-0 Receiver establishes the RF network, using one of several channels in the 2.4 GHz ISM band. The sensors then transmit on each of the channels until they locate the receiver. Operation continues on that channel until communication problems develop. If the receiver cannot communicate with the sensors, the receiver changes to a different channel. The sensors then locate the receiver on the new channel, and continue operating on that channel as long as reliable communications occur.

These data-transmission sequences greatly enhance the success of the wireless room sensing system data transmissions. Transmitting short, high-speed data messages at periodic intervals also reduces RF data-transmission collisions and interference with other Wi-Fi and Bluetooth transmissions. The DSSS technology also prevents the most common RF interference.

To prevent RF interference and transmission failures, maintain an adequate distance between RF transmitting devices. Some examples include:

- Mount the WRZ Series Sensor more than 3 ft (1 m) from a WRZ-7860-0 Receiver.
- Do not use a cell phone within 3 ft (1 m) of a WRZ Series Sensor or WRZ-7860-0 Receiver.
- Mount Wi-Fi access points at least 20 ft (6 m) from any WRZ Series Sensor or WRZ-7860-0 Receiver.
- Mount other low-power Wi-Fi transmitting devices at least 3 ft (1 m) from any WRZ Series Sensor or WRZ-7860-0 Receiver.
- 2.4 GHz cordless phones and some older phone headsets can cause interference. Do not use anywhere near a One-to-One Wireless Room Sensing System.

- Avoid areas where there are microwave ovens between the WRZ sensor and the WRZ-7860 receiver.

To secure One-to-One RF wireless messages, the WRZ Series Sensors and WRZ-7860-0 Receiver use a custom Johnson Controls message protocol that prevents deciphering any One-to-One data transmissions received or intercepted by any other receiving devices.

Radio frequency addresses for One-to-One applications

To establish wireless RF associations in One-to-One applications, assign and configure the same, unique RF address on the WRZ-7860-0 Receiver and the WRZ Series Sensor or sensors associated with that receiver.

To configure the RF address for a WRZ-7860-0 Receiver manually, position the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block on the receiver. See *Setting the WRZ-7860-0 Receiver RF Address*.

The RF address (**TRANSMITTER ID** and **AREA**) for each WRZ Series Sensor associated with a WRZ-7860-0 Receiver must match the receiver RF address. To configure the WRZ Series Sensor's RF address, position the numbered switches on the **TRANSMITTER ID** DIP switch block and the **AREA** address DIP switch block on the sensor. See *Setting the WRZ Series Sensor RF Address*.

The **RF TRANSMITTER ID** and **AREA** DIP switch blocks on the sensor and receiver are binary switch blocks. The **TRANSMITTER ID** switches on each switch block are assigned numbers (1, 2, 4, 8, 16, 32, 64, and 128). The **TRANSMITTER ID** address is a number from 0 to 255, which is equal to the sum of the numbers of the switches that are in the **ON** position. As an example, placing switches 1, 4, 8, and 32 in the **ON** position establishes a **TRANSMITTER ID** address of 45 for the device.

The **AREA** address switches on each switch block are assigned numbers (1, 2, 4, and 8). The **AREA** address is a number from 0 to 15, which is equal to the sum of the numbers of the switches that are in the **ON** position. Use the **AREA** address to distinguish different floors, wings, or areas of a building. Together, the **TRANSMITTER ID** and **AREA** DIP switches provide 4,096 unique RF addresses.

ⓘ **Note:** To use with an MS-ZFR181x-x and MS-ZFR182x-x Wireless Field bus Router or Repeater, set all the **AREA** DIP switches on the WRZ-7860-0 Receiver to the **OFF** (0) position. The **AREA** DIP switch is not used on the MS-ZFR181x-x and MS-ZFR182x-x. In addition, set the most significant bit of the **TRANSMITTER ID** to the **OFF** position on both the WRZ-7860-0 and MS-ZFR181x-x and MS-ZFR182x-x. This setting provides 128 TRANSMITTER IDs to use with a repeater. Since these 128 TRANSMITTER IDs overlap with the PAN OFFSET of the ZFR or ZFR Pro mesh system, take care to select a **TRANSMITTER ID** that is not in use in the local area.

In multiple-sensor applications, two or more WRZ Series Sensors have the same **TRANSMITTER ID** and **AREA** addresses, distinguished by the **SENSOR #** selection on the WRZ Series Sensor. The **SENSOR #** may be 199, 200, 201, 202, or 203.

If the WRZ-7860-0 Receiver fails to respond to a WRZ Series Sensor with a matching RF address, the receiver

may have already locked onto another sensor with the same RF address. To clear the receiver from an incorrect association, momentarily change the receiver's RF address to a different RF address and then back again to the original RF address, all while power is applied to the receiver.

Never use the same RF address (**TRANSMITTER ID** and **AREA**) for two receivers that are in the same building or general location. RF signals can reflect off of objects or pass through glass windows, and it is possible for RF signals to travel between buildings or reach receivers several floors away.

ⓘ **Note:** In single-sensor and multiple-sensor applications, a One-to-One sensing system interfaces with only one supported controller. Since the WRZ-7860-0 Receiver and WRZ Series Sensor combination effectively replaces a network sensor, the same controller applications where a network sensor would otherwise be used are supported.

Using an MS-ZFR18xx Series Wireless Field Bus Router as a repeater in a One-to-One application

About this task:
To use an MS-ZFR18xx Series Wireless Field bus Router as a repeater in a One-to-One application, complete the following steps:

1. Set the **AREA** DIP switches on the WRZ-7860-0 Receiver and the WRZ Series Sensor to the **OFF** position.
2. Set the **TRANSMITTER ID** DIP switches on the WRZ-7860-0 Receiver and the WRZ Series Sensor to the required RF address. Set the **PAN OFFSET** DIP switches on the MS-ZFR18xx Series Wireless Field bus Router to the same RF address.
3. Apply power to the WRZ-7860-0 Receiver and wait approximately 5 seconds.
4. Apply power to the MS-ZFR18xx Series Wireless Field bus Router and wait approximately 30 seconds for it to associate with the WRZ-7860-0 Receiver.
5. Apply power to the WRZ Series Sensor and wait approximately 30 seconds for it to associate with the RF network.
6. Turn the WRZ-7860-0 Receiver to the **OFF** position and wait approximately 2 minutes. Doing so gives the WRZ Series Sensor time to discover the loss of the WRZ-7860-0 Receiver, and to associate with the MS-ZFR18xx Series Wireless Field bus Router.
7. Turn the WRZ-7860-0 Receiver to the **ON** position. Communication reestablishes with the WRZ-7860-0 Receiver, and sends the WRZ Series Sensor messages through the MS-ZFR18xx Series Wireless Field bus Router.

Notes:

- If the WRZ-7860-0 Receiver, WRZ Series Sensor, and MS-ZFR18xx Wireless Field bus Router are within range but fail to communicate with each other, reset each device. With power applied to each device, change any DIP switch for a few seconds and then move it back to its original position. Each device resets and erases any former network settings.
- The MS-ZFR182x-0 and MS-ZFR183x-0 Pro Series Router/Repeater are not compatible with the WRZ-7860 system.
- The WRZ sensor automatically associates with the ZFR Repeater if it has problems communicating directly with the 7860 because of weak signals due to distance, obstructions, or RF interference.

Detailed procedures

One-to-One Wireless Room Sensing System commissioning overview

A One-to-One Wireless Room Sensing System that uses the WRZ-7860-0 Receiver and WRZ Series Sensor combination is relatively simple to install, commission, configure, and troubleshoot. Some of the required procedures are presented in other documentation.

- See Table 1 for references to documents with information on how to locate and install WRZ Series Sensors and the WRZ-7860-0 Receiver.
- Refer to the supported controller's documentation for information on how to install, commission, configure, and troubleshoot the target controller.

Commissioning procedure requirements

To commission a One-to-One Wireless Room Sensing System application, you need:

- One to five WRZ Series Sensors
- One WRZ-7860-0 Receiver
- An installed, commissioned, and configured field controller
- An SA bus interface cable, available pre-configured in various lengths, or you can fabricate other length cables as required

Commissioning procedure workflow

You can perform the procedure to commission and configure a One-to-One Wireless Room Sensing System in a variety of sequences. The job site and workflow dictate the order that you perform these procedures. The following procedure order is a typical sequence.

To commission and configure a One-to-One system, perform the following procedures:

- Install, commission, and configure the target field controller.
- Commission or address, and install the WRZ-7860-0 Receiver.

- Connect the WRZ-7860-0 Receiver to the target controller.
- Install and address the WRZ Series Sensors.
- Test the RF signal strength between the associated devices.
- Test and confirm operation of the complete One-to-One application.

Planning and recordkeeping

When you commission and configure a control system with several One-to-One wireless room sensing systems and multiple sensors, receivers, and controllers, obtain a set of the building plans, the HVAC plans, and the building specifications.

Use the building plans and specifications to determine the best line-of-sight RF pathways, and the potential locations for the sensors and receivers. Test the potential device locations to determine if the RF signal strength is adequate, and then adjust the device locations as necessary.

ⓘ **Note:** A successful wireless field bus system requires you to maintain a minimum wireless signal strength between system components. Component location is an important part of system design. Distance, metal objects, and other obstructions can reduce or completely block the wireless signal transmissions.

Create a sensor and receiver association table to record all of the device addresses and a device map that shows the locations of all sensors, receivers, and supported field controllers for the final as-built control system.

ⓘ **Note:** Do not create duplicate RF addresses on any of the receivers at your job site. Duplicate RF addresses can cause a variety of problems in One-to-One applications.

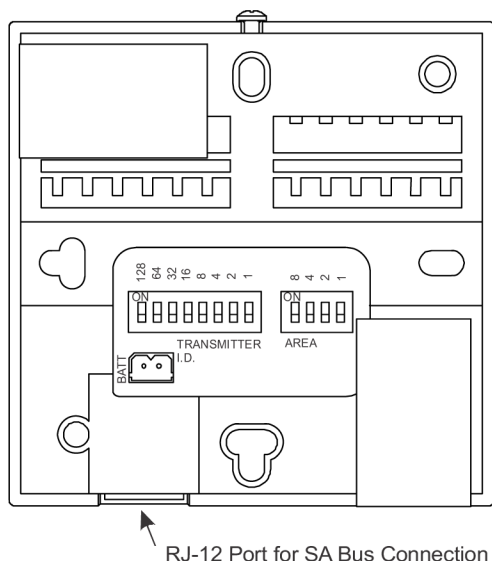## Setting the WRZ-7860-0 Receiver RF address

About this task:
The WRZ-7860-0 Receiver requires a unique RF address to communicate with associated WRZ Series Sensors. To set the RF address for the receiver, position the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block. See *Radio Frequency Addresses for One-to-One Applications* for more information.

To manually set the WRZ-7860-0 Receiver RF address, complete the following steps:

1. Disconnect the power to the SA bus.
2. Set the numbered switches on the **TRANSMITTER ID** address DIP switch block and the **AREA** address DIP switch block to the required RF address. See Figure 5.

ⓘ **Note:** To use with an MS-ZFR181x-x and MS-ZFR182x-x Series Wireless Field Bus Router or Repeater, set all the **AREA** DIP switches on the WRZ-7860-0 Receiver to the **OFF** (0) position. Do not use the **AREA** DIP switch on the MS-ZFR181x-x and MS-ZFR182x-x. In addition, set the most significant bit of the **TRANSMITTER ID** to the **OFF** position on both the WRZ-7860-0 and MS-ZFR181x-x and MS-ZFR182x-x. This setting provides 128 **TRANSMITTER IDs** to use with a repeater. Since these 128 **TRANSMITTER IDs** overlap with PAN OFFSET of the ZFR or ZFR Pro mesh system, take care to select a **TRANSMITTER ID** that is not in use in the local area.

Figure 5: Transmitter ID and area DIP switch blocks on a WRZ-7860-0 Receiver

RJ-12 Port for SA Bus Connection

3. Check the **AREA** DIP switch block on the back of the associated sensor and be sure that the **POWER** switch is set in the **OFF** position Figure 8. See *Setting the WRZ Series Sensor RF Address* for more information.
4. Connect the SA bus to the WRZ-7860-0 Receiver.
5. Set the field controller **POWER** switch to the **ON** position.

ⓘ **Note:** Five seconds after you apply power, the red LED flashes to indicate the firmware revision. For example, the LED flashes three times during the startup process to indicate firmware revision 3.

Result
Repeat this procedure for each receiver in your application.

ⓘ **Note:** Do not create duplicate addresses on any of the receivers at your job site. Duplicate addresses can cause a variety of problems in One-to-One applications.

Setting the WRZ Series Sensor RF address

About this task:

To associate the WRZ Series Sensors to a WRZ-7860-0 Receiver, set the **TRANSMITTER ID** DIP switches and the **AREA** DIP switches on the sensors to the same positions as the **TRANSMITTER ID** DIP switches and the **AREA** DIP switches on the target WRZ-7860 Receiver, so that the RF address setting on both devices match. See *Radio Frequency Addresses for One-to-One Applications* for more information.

In most One-to-One applications, use a single sensor, and select 199 on the **SENSOR #** DIP switch. However, if you use two or more sensors in your One-to-One application, then set the first sensor for 199, the second set for 200, the third set for 201, the fourth set for 202, and the fifth set for 203.

To set the WRZ Series Sensor RF address, **TRANSMITTER ID** and **AREA**, and select the sensor number, **SENSOR #**:

1. Remove the WRZ Series Sensor housing from the sensor mounting base as shown in Figure 6 or Figure 7.

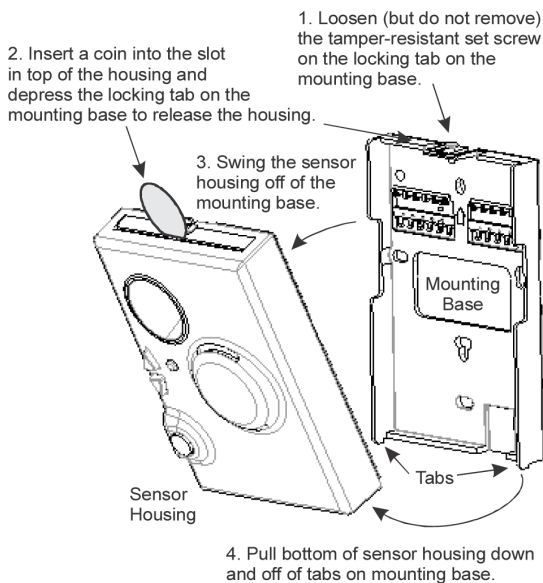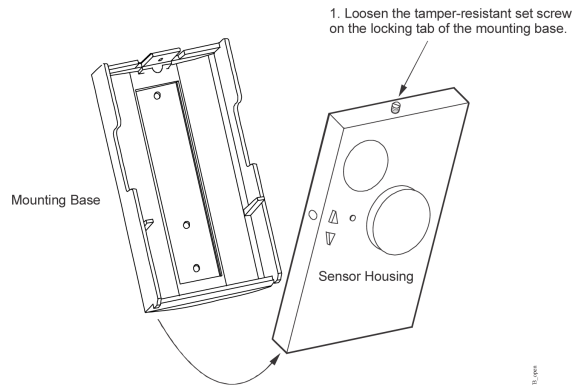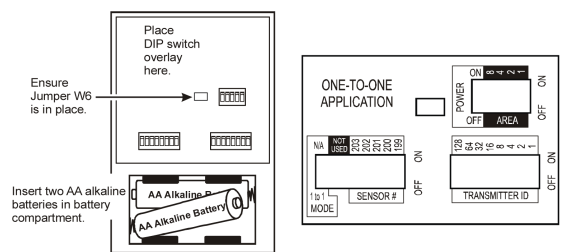**Figure 6: Removing the sensor housing from its mounting base**

2. Insert a coin into the slot in top of the housing and depress the locking tab on the mounting base to release the housing.

1. Loosen (but do not remove) the tamper-resistant set screw on the locking tab on the mounting base.

3. Swing the sensor housing off of the mounting base.

Mounting Base

Sensor Housing

Tabs

4. Pull bottom of sensor housing down and off of tabs on mounting base.

Figure 7: Removing the WRZ-TTB0000-5 Series Sensor housing from its mounting base

1. Loosen the tamper-resistant set screw on the locking tab of the mounting base.

Mounting Base

Sensor Housing

2. Swing the sensor housing off of the mounting base.

2. Move the **ONE-TO-ONE APPLICATION** DIP switch overlay card over the DIP switches. See Figure 8.

3. Locate the power switch on the left side of the **AREA** DIP switch block and set it to the **OFF** position.

4. Set the WRZ Series Sensor **MODE** DIP switch on the far left of the **SENSOR number** DIP switch block to the 1-to-1 or down position.

5. Set the **SENSOR number** to 199 for applications with only one sensor for each controller.

   ⓘ **Note:** Use the other settings for applications with a single controller that performs temperature or humidity averaging or high or low selection within a zone.

6. To match the receiver RF address, set the numbered switches on the **AREA** DIP switch block and on the **TRANSMITTER ID** DIP switch block to the same positions as the numbered switches on the **AREA** and **TRANSMITTER ID** DIP switch blocks on the associated receiver. See Figure 8.

Figure 8: Back of the WRZ Series sensor housing and One-to-One application DIP switch overlay

Place DIP switch overlay here.

Ensure Jumper W6 is in place.

Insert two AA alkaline batteries in battery compartment.

AA Alkaline Battery

ONE-TO-ONE APPLICATION

POWER

AREA

NA NOT USED 203 202 201 200 199 ON OFF 128 64 32 16 8 4 2 1 ON OFF

1 to 1 MODE SENSOR # TRANSMITTER ID

7. Ensure to install the batteries correctly and move the sensor **POWER** switch to the **ON** position, if you put the sensor into operation.

8. Reinstall the sensor housing to the mounting base.

9. If you configure and power on the associated receiver, press the sensor occupancy button to determine if the sensor and receiver communicate. See *Checking a One-to-One Application's RF Signal Strength*.

10. Reverse the above steps to install the housing.

Connecting a WRZ-7860-0 Receiver to the supported controllers

Connect an SA bus interface cable between the SA bus port on the controller and the SA bus port on the WRZ-7860-0 Receiver. See Figure 5. Various length pre-made SA bus cables are available. For example, CBL-NETWORK6-0.

Configuring supported controllers for One-to-One applications

The controllers see the WRZ-7860-0 Receiver and WRZ Series Sensor combination as a network sensor. For example, NS8000 Series Network Sensors. Configure the controllers to use network sensors.

Troubleshooting

Checking a One-to-One application's RF signal strength

About this task:
Verify adequate RF signal strength between sensors and receivers, especially in applications with excessive distances or metal barriers such as ductwork, concrete with metal reinforcements, equipment rooms, or elevator shafts. You can check the RF signal strength in One-to-One wireless sensing system applications ahead of time by completing the following steps:

1. Set the DIP switches on the sensor and receiver or the wireless sensing system tool to the same RF address **TRANSMITTER ID** and **AREA**.
2. Use the battery pack of the ZFR-HPSST-0 Wireless Sensing System Tool to provide power to theWRZ-7860-0 two-pin connector on the back of the WRZ-7860-0, just below the **TRANSMITTER ID** DIP switch block. See Figure 5.
   - ⓘ **Note:** The battery pack contains a small power switch.
3. Hold the WRZ Series Sensor near its required mounting location in the zone, with the battery installed and the power switch set to **ON**.

Result
See Table 3 for troubleshooting additional problems or symptoms, possible causes, and suggested courses of action.

4. Observe the **RF** LED on the receiver. Approximately every 60 seconds, an RF transmission occurs and the LED blinks. You can force the sensor into Rapid Transmit Mode (RTM) by pressing the WRZ Series Sensor's manual occupancy override button for 5 seconds or more.

   In RTM, the sensor transmits a signal every 10 seconds for a period of 5 minutes. After each transmission, the occupancy override LED on the sensor flashes on, one, two, or three times, to indicate the signal strength between the sensor and the receiver. Also, the signal strength LED on the receiver blinks off to indicate the relative signal strength between the sensor and receiver.

   - Three consecutive flashes of the sensor LED or blinks of the receiver LED every 10 seconds indicate an excellent signal strength.
   - Two consecutive flashes of the sensor LED or blinks of the receiver LED every 10 seconds indicate a good signal strength.
   - One flash of the sensor LED or blink of the receiver LED every 10 seconds indicates a weak signal strength. A weak signal strength may result in sporadic loss of data, move the sensor or receiver mounting locations until the signal strength improves.
     - You may need to relocate the sensor or receiver to improve the RF signal reception. You can wire the WRZ-7860-0 Receiver on the SA bus up to 100 ft (30.5 m) from a supported Johnson Controls controller or you can install an MS-ZFR181x-x and MS-ZFR182x-x Repeater to extend the range between the WRZ sensor and WRZ-7660 receiver.

5. Check the receiver for adequate RF signal strength after the building occupant moves into the space. Check a second time to ensure that none of the occupant furnishings or equipment interferes with RF signal reception.

Table 3: Troubleshooting One-to-One wireless sensing applications

Problem or symptom	Cause or action
WRZ Series Sensor does not associate with the target receiver. This is indicated by no flashes on the occupancy override LED after you release the manual occupancy override button. While you press in the manual occupancy override button, the LED indicates battery status as ON if the battery is good.	The WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the instructions included with the wireless room sensor for information on replacing the batteries.
	The sensor and receiver RF addresses may not match. Check or reconfigure the RF addresses on the sensor and the associated receiver. See *Setting the WRZ-7860-0 Receiver RF Address* and *Setting the WRZ Series Sensor RF Address* for more information.
	The sensor and receiver may be out of RF signal range or may be an RF signal obstruction between them. Check the RF signal strength and path between the sensor and the receiver using the ZFR-HPSST-0 Wireless Sensing System Tool.
	The receiver antenna may be positioned poorly. Reposition the sensor and the WRZ-7860-0 Receiver, and ensure that the antenna symbol orients vertically, either up or down. Recheck the sensor or receiver association at the sensor.
	The receiver may have been used with other sensors and does not allow new associations. With power applied to the receiver, change any DIP switch for a few seconds and then move it back to its original position. The receiver resets and erases any former network settings.
The WRZ-7860-0 Receiver may not have power or appears dead. For example, the SA LED does not flicker as expected for SA bus activity, and the RF LED is off.	Verify that the controller is powered and configured as if for a hardwired network sensor. Ensure that the SA bus cable is correctly connected or that its plugs are correctly crimped. With one end connected to the powered controller, check the plug end that connects to the WRZ-7860-0 Receiver. Pin 6 should be about 15 VDC positive with respect to Pin 5.
Zone temperature and humidity control or zone temperature setpoint is incorrect, unreliable, or erratic.	The WRZ Series Sensor batteries may be low. Replace the sensor batteries. Refer to the instructions included with the wireless room sensor for information on replacing the batteries.
	More than one sensor may have the same RF address as the receiver and set with the same sensor number. Check the sensor and receiver addresses. See *Setting the WRZ-7860-0 Receiver RF Address* and *Setting the WRZ Series Sensor RF Address* for more information.
	An obstruction may have been placed in the RF path between the sensor and the receiver. Check the RF path and signal strength between sensor and receiver.
	New RF or Wi-Fi interference may have been introduced into the One-to-One environment. Check for changes to the RF or Wi-Fi environment and new sources of RF interference.
	Two receivers may have duplicate RF addresses and overlapping signal coverage with associated sensors. Check for duplicate RF addresses and ensure there is no signal overlap in applications with duplicate RF addresses.
	Wiring between the receiver and the field controller may be incorrect or damaged. Check the wiring between the receiver and the field controller.
	Sensor may be defective or damaged. Turn off the suspect sensor and configure a new sensor with the receiver address; then, check the operation of the new sensor with the receiver.

Technical specifications

Table 4: WRZ Series Wireless Room Sensors technical specifications

Specification	Description
Power requirements	3 VDC supplied by two 1.5 VDC AA alkaline batteries included with the sensor Battery life: 48 months; 36 months minimum
Addressing	DIP switches, field adjustable: Area, transmitter ID, sensor number, MS/TP address, network number, and zone address, depending on model
Ambient conditions	**Operating:** 32°F to 122°F (0°C to 50°C), 5% RH to 95% RH, noncondensing **Storage:** -40°F to 160°F (-40°C to 71°C), 5% RH to 95% RH, noncondensing
RF band	Direct-Sequence, Spread-Spectrum, 2.4 GHz ISM bands
Transmission power	10 mW maximum
Transmission range	**Wireless mesh network application:**100 ft (30 m) maximum indoor line-of-sight; 50 ft (15 m) practical average indoor **One-to-One application:**150 ft (45 m) maximum indoor line-of-sight; 100 ft (30 m) practical average indoor
Transmissions	Every 60 seconds (±20 seconds)
Temperature sensor accuracy; temperature only models, and temperature and humidity models	1.0°F /0.6°C over the range of 55°F to 85°F (13°C to 29°C); 1.5°F/0.9°C over a range of 32°F to 55°F (0°C to 13°C) and 85°F to 110°F (29°C to 43°C)
Humidity measurement range; temperature and humidity models	**Full range:** 0% RH to 100% RH
	Calibrated range: 10% RH to 90% RH at 74°F (23°C)
Humidity sensor accuracy; temperature and humidity models	±3% RH across the range of 20% RH to 80% RH, ±6% RH across the range of 10% RH to 20% RH and 80% RH to 90% RH; within the temperature range of 55°F to 85°F (13°C to 29°C)
Temperature sensor type; temperature only models, and temperature and humidity models	Internal 10k ohm Negative Temperature Coefficient (NTC) thermistor
Humidity sensor type; temperature and humidity models	Planar capacitive polymer sensor
PIR Occupancy Sensor Motion Detection (Models with PIR Occupancy Sensor)	Minimum 94 angular degrees up to a distance of 15 ft (4.6 m); based on a clear line of sight
Materials	NEMA 1 white plastic housing
Compliance	**United States:** Transmission complies with FCC Part 15.247 regulations for low Power unlicensed transmitters; Transmitter FCC identification: TFB-MATRIXL or OEJ-WRZRADIO
	Canada: Industry Canada IC: 5969A-MATRIXL or 279A-WRZRADIO
CE	**Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the RED, EMC, LVD, and RoHS Directives.
	Australia and New Zealand: Australia/NZ emissions compliant, Regulatory Compliance Mark [RCM]
	Japan: Transmission complies with Article 38-24 Paragraph 1 of the Radio Law Certification Number: ATCB012834
Shipping weight	0.3 lb (0.14 kg)

Table 5: WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems technical specifications

Specification	Description
Field controller interface	Power and SA bus interface between WRZ-7860-0 Receiver and controller
Supply voltage	Nominal 15 VDC through the SA bus; 6.7 to 16.5 VDC required
Current consumption	10 mA maximum
Addressing	DIP switches, field adjustable for up to 4,096 nique RF addresses
Ambient limits	**Operating:** 32°F to 122°F (0°C to 50°C), 5% RH to 95% RH, noncondensing **Storage:** -40°F to 160°F (-40°C to 71°C), 5% RH to 90% RH, noncondensing
RF band	Direct-Sequence, Spread-Spectrum, 2.4 GHz ISM bands
Transmission power	10 mW maximum
Transmission range	150 ft (45 m) maximum indoor line-of-sight; 100 ft (30 m) practical average indoor

Table 5: WRZ-7860-0 Receiver for One-to-One Wireless Room Sensing Systems technical specifications

Specification	Description
Receiver outputs	One RJ-12 Port for SA communication bus output, sensed zone temperature and humidity, temperature setpoint, and Occupancy Override data
Temperature system accuracy	**WRZ Series Wireless Room Sensor:**1.0°F (0.6°C) over the range of 55°F to 85°F (13°C to 29°C); 1.5°F (0.9C°) over the range of 32°F to 55°F (0°C to 13°C) and 85°F to 110°F (29°C to 43°C)
Sensor type	**WRZ Series Wireless Room Sensor:** Internal 10k ohm Negative Temperature Coefficient (NTC) thermistor
Materials	NEMA 1 white plastic housing; UL94-5VB and V-0 Plenum flammability rated
Compliance	**United States:** Transmission complies with FCC Part 15.247 regulations for low power unlicensed transmitters; transmitter FCC identification: TBF-MATRIXL or OEJ-WRZRADIO
	Canada: Industry Canada IC: 5969A-MATRIXL or 279A-WRZRADIO
	Australia and New Zealand: RCM Mark, Australia/NZ emissions compliant
	Japan: Transmission complies with Article 38-24 Paragraph 1 of the radio law certification number: ATCB012834
CE	**Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the RED, EMC, LVD, and RoHS Directives.
Shipping weight	0.2 lb (0.09 kg)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Patents

Patents: https://jcipat.com

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